Monitoring and non-invasive diagnostics Fraunhofer IIS and Fraunhofer ISC





Joseph von Fraunhofer (1787 – 1826)



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Researcher

Discovery of the "Fraunhofer lines" in the solar spectrum

Inventor

 New methods for processing lenses

Entrepreneur

 Director and partner in a glassworks



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Die Fraunhofer-Gesellschaft German research landscape





Die Fraunhofer-Gesellschaft Locations in Germany

- 72 institutes and independent research units
- more than 26,000 staff
- Fraunhofer IIS in Erlangen
 Digital Health Systems
- Fraunhofer ISC in Würzburg
 - Nano technologies and functional materials

- Institute/independent research unit
- Other research unit
- * Headquarter





Fraunhofer IIS

Medical Sensors and Data Analytics





Medical Sensor Systems & Biosignal Processing Application Scenarios





Medical Sensor Systems & Biosignal Processing Competences

- Miniaturized Sensors: Mobile application, high comfort to wear
- Onboard Signal Processing: Direct feedback to the user
- Wireless Communication : Comfortable and good interoperability
- Prototypes in discrete technology:
 - Quick development, low cost
 - Concise field data for proof-of-concept





- Sleep Home Monitoring
- FitnessSHIRT
- CardioTextile













- Sleep Home Monitoring
- FitnessSHIRT
- CardioTextile
- Lab-on-Chip Instrumentation and IVD control units







- **Sleep Home Monitoring**
- **FitnessSHIRT**
- CardioTextile
- Lab-on-Chip Instrumentation
- Sensor integration













- Sleep Home Monitoring
- FitnessSHIRT
- CardioTextile
- Lab-on-Chip Instrumentation
- Sensor integration
- Contacless sensing
- Medical Communication







Medical Sensor Systems & Biosignal Processing Our services





Medical Sensor Systems & Biosignal Processing Dielectric elastomer sensors

Dielectric elastomer sensors (DES) consist of a very elastic elastomer film (silicone), coated on both sides with highly elastic electrodes (carbon black, graphite, metal particles)





Medical Sensor Systems & Biosignal Processing Dielectric elastomer sensors

- Mechanical deformation (elongation or compression) leads to a reduction of thickness and simultaneously to an increase of surface
- Electric capacitance as measured parameter increases







Medical Sensor Systems & Biosignal Processing Textile integration of elastomer sensors

<u>Ironing:</u>

- structures are manufactured separately as ironing films
- application by a conventional iron in a short time (≈ 1 minute) at low temperatures (80 °C), applied to polyester and cotton
- allows individual placement of structure
- intended for smaller quantities, retrofitting



🗾 Fraunhofer IIS

Direct textile printing:

- large-area structures
- short time process, integrated into the further processing of the textiles
- Intended for mass production



Medical Sensor Systems & Biosignal Processing Textile integrated elastomer sensors

- Foot pressure measurement system for medical application:
 - 3-dimensional pressure distribution inside a shoe for long-term measurements e.g. diabetic foot syndrome
- Dielectric elastomer sensors are extremely suitable for textile integration:
 - soft and elastic
 - chemically stable to: water, washing agent, desinfectant, washproof
 - medical grade





Medical Sensor Systems & Biosignal Processing Textile integrated elastomer sensors

Space resolved pressure sensors in seats / matress, preventing bedsores (bed or wheelchair), Decubitus





Medical Sensor Systems & Biosignal Processing Textile integrated elastomer electrodes

- Monitoring of vital parameters like
 - continous ECG measurement in clothing
 - measurement of pulse, heart rate variation
 - measurement of electromyogram (EMG) of muscles activity
- Activating of muscles (EMS) or nerves (TENS) for muscle and cardiovascular training







Fraunhofer IIS and Fraunhofer ISC Contact

Visit us in hall 10 booth 618



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